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A FURTHER STUDY OF THE SUBDIVISIONS OF THE FIRST MILLIMETER OF "CENTIMETER A."

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According to the report of Professor Hilgard accompanying "Centimeter A," the corrections of the tenths of the first millimeter of "A" are as follows:

(A "+" sign indicates that the space is too short, and a "—" sign indicates that it is too long.)

Tenths of First Millimeter.	Correction.	Correction Reckoning from the Mean of the Initial Lines.
1	$+0.54\mu$	+0.54
2	+0 33	+0.87
3	+0.65	+1.52
4	—0.10	+1.42
5	+0.07	+1.49
6	+0.52	+2.01
7	+0.37	+2.38
8	+0.48	+2.86
9	+0.41	+3.27
10	—0.16	+3.11

There must be some error, which is very likely typographical, in this part of the report, for the correction to be applied to the first millimeter is stated in another part of the same report to be only $+0.31\mu$, instead of $+3.11\mu$.

Professor Rogers makes the correction for the first millimeter to be $+0.63\mu$; but this disagreement may be accounted for by the fact that Professor Hilgard's measurements were made from the mean position of the three lines defining each subdivision, while Professor Rogers's were made from the middle defining line of each triplet. My own measurements have all been made from the middle defining lines, except in the case of the subdivisions of the first tenth of the first millimeter, in which the defining lines are single. A filar micrometer was used in every measurement, and each series is the mean of from three to five readings at each end of the space measured. The figures in the separate columns represent the relative corrections to the respective tenths in fractions of a mikron.

Objective.	1	2	3	4	5	6	7	8	9	10
1 inch Bausch & Lomb..	+0.15	+0.08	+0.68	—1.17	—0.46	+0.46	+0.04	+0.15	—0.08	+0.19
$\frac{3}{5}$ Zeiss....	+0.20	+0.05	+0.85	—0.90	—0.55	+0.20	—0.15	+0.35	—0.15	+0.10
$\frac{1}{2}$ Bausch & Lomb, Opaque Illuminator,	—0.54	+0.47	+1.02	—0.43	—0.18	+0.04	—0.49	+0.09	—0.02	+0.09
Same	+0.56	—0.11	+0.45	—0.88	—0.07	+0.13	—0.31	—0.04	—0.11	+0.31
Same	+0.04	—0.07	+0.58	+0.56	—0.84	+0.09	—0.20	+0.17	—0.18	—0.18
Same	+0.14	—0.05	+0.95	—0.83	—0.58	0.00	—0.25	+0.09	+0.09	+0.36
Same	+0.43	+0.14	+0.90	—0.99	—0.76	+0.17	—0.05	+0.24	—0.14	—0.02
Mean	+0.14	+0.07	+0.78	—0.66	—0.50	+0.16	—0.20	+0.15	—0.08	+0.12
Correction for error in total length,	+0.06	+0.06	+0.06	+0.06	+0.06	+0.06	+0.06	+0.06	+0.06	+0.06
Total correction........	+0.20	+0.13	+0.84	—0.60	—0.44	+0.22	—0.14	+0.21	—0.02	+0.18

My investigation of the subdivisions of the first tenth has been confined to the second, third, fourth, fifth, sixth, seventh, eighth, ninth, tenth and eleventh $\frac{1}{100}$ millimeter spaces. The first and twelfth were not measured. In December, 1885, I commenced the investigation of these subdivisions, but was unable to finish it. Two series of measurements were made at that time with a $\frac{1}{4}$ Bausch & Lomb opaque illuminating objective and a filar micrometer, the mean of which is included in the present investigation.

Date.	Objecfive.	Value of one div. of Micrometer.	2	3	4	5	6	7	8	9	10	11
Dec. 26&27,'85.	$\frac{1}{4}$ B. & L.	0.126μ	+0.38	—0.01	+0.05	—0.39	+0.14	+0.27	—0.14	—0.12	+0.09	—0.26 *a*
Sept. 12, 1889.	$\frac{1}{18}$ Zeiss.	0.01651	+0.36	+0.02	+0.06	—0.42	+0.15	+0.28	—0.25	—0.07	+0.08	—0.21 *b*
" 12, "	$\frac{1}{18}$ "	0.02166	+0.33	0.00	+0.04	—0.41	+0.15	+0.25	—0.22	—0.14	+0.20	—0.22 *c*
" 15, "	$\frac{1}{25}$ Spencer.	0.02071	+0.31	—0.05	+0.05	—0.43	+0.17	+0.32	—0.21	—0.06	+0.11	—0.19 *d*
" 18, "	$\frac{1}{10}$ "	0.0401	+0.32	+0.03	+0.03	—0.49	+0.16	+0.27	—0.18	—0.16	+0.20	—0.18 *e*
" 19, "	$\frac{1}{10}$ "	0.0256	+0.36	—0.01	0.00	—0.47	+0.17	+0.25	—0.23	—0.05	+0.16	—0.18 *f*
Mean			+0.34	0.00	+0.04	—0.44	+0.16	+0.27	—0.21	—0.10	+0.14	—0.21
Correction for error of total length			+0.02	+0.02	+0.02	+0.02	+0.02	+0.02	+0.02	+0.02	+0.02	+0.02 *g*
Total correction			+0.36	+0.02	+0.06	—0.42	+0.18	+0.29	—0.19	—0.08	+0.16	—0.19
Correction for same spaces as per report of Professor Hilgard.			+0.34	+0.05	+0.09	—0.41	+0.20	+0.39	—0.19	—0.05	+0.20	—0.18

REMARKS.

a Bullock filar micrometer and Smith's vertical illuminator.
b Zentmayer filar micrometer and Smith's vertical illuminator.
c Bullock filar micrometer and Smith's vertical illuminator.
d Bullock filar micrometer and Smith's vertical illuminator. Cover correction=10.5.
e Bullock filar micrometer and Smith's vertical illuminator. Cover correction=2 rev. 0.¾.
f Bullock filar, Smith's vertical illuminator, and Bausch & Lomb Amplifier. Cover correction=2 rev. 0.¾.
g This is $\frac{1}{10}$ the correction for the first $\frac{1}{10}$ millimeter=+0.20μ.

It will be observed that the agreement between these two series of corrections is quite close. Indeed they are practically identical, the greatest discrepancy in the seventh space being only $\frac{1}{10}$ μ.

The agreement between the series of corrections found in 1885, with a $\frac{1}{4}$ objective and filar micrometer, and the values found in September, 1889, under a high power, would seem to show that the use of high powers in micrometry does not give so great an advantage as has been claimed by some writers, notably the late Dr. J. G. Richardson, of Philadelphia, with reference to the measurement of blood-corpuscles. The experience of the writer in this respect is to the effect that, while one cannot measure what he cannot see, yet clearness of definition is of more importance than high amplification.